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Notes on Japanese Ahermatypic Corals—I New Species and Subspecies of *Culicia* and *Phyllangia*

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Abstract A new subspecies, *Culicia japonica tenuisepes*, found in shallow waters of Tsukumo Bay, Sea of Japan and two new species, *Culicia subaustraliensis* from shallow waters and *Phyllangia echinosepes* from 90 m depth off Izu Hachijo Island, the Pacific coast of Honshu are described and illustrated. These species differ from hitherto known species or subspecies not only morphologically, but also by morphometrical features such as the correlation between calice diameter and septal number or the ordering of septal width.

Key words: ahermatypic coral, new species, new subspecies, *Culicia*, *Phyllangia*, Japan

Introduction

During a revisionary study of Japanese ahermatypic corals, we found some new species along the coast of Boso Peninsula, Izu Peninsula, off Izu Hachijou Island, the Pacific coast of Honshu, and along the coast of Sea of Japan (Ogawa & Takahashi, 1993, 1995; Ogawa et al., 1996). In this first report we describe one new species and one new subspecies of *Culicia* (Rhizangiidae), and one new species of *Phyllangia* (Caryophylliidae), with morphometrical comparisons to related species. Corallite morphology was measured directly with vernier calipers. Septa were counted and measured by using a binocular microscope with an eye-piece micrometer.

Suborder Faviina
Superfamily Faviioidea
Family Rhizangiidae
Culicia Dana, 1846

Culicia japonica tenuisepes n. ssp.

(Japanese name: tsukumo-juzu-sango, new)

(Plate VI. Fig 1., Text-figs. 1–3)

Material examined

Holotype: 13 cm × 7 cm, consisting of about 200 corallites. Paratype: 15 cm × 10cm, consisting of about 350 corallites. Three other additional specimens. All the specimens were collected on 14 December, 1995, by K. Sakai using SCUBA, from 0.5 to 1.5 m deep, at Jogasaki and Hinodesaki, entrance of Tsukumo Bay, an inlet opening to the Sea of Japan, on the Noto Peninsula, Uchiura, Ishikawa Prefecture, Japan (Sakai et al., 1996). The holotype is deposited in the National Science Museum, Tokyo (NSMT-Co 563); the paratype is deposited in the Noto

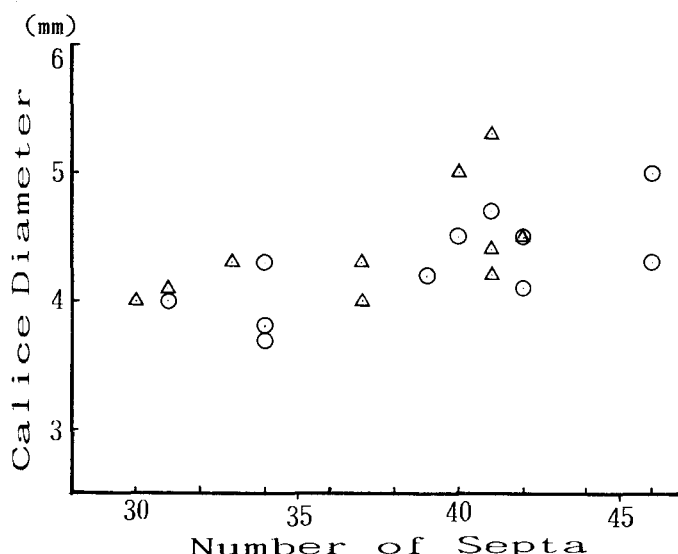


Fig. 1. Relationship between calice diameter and number of septa. ○: *Culicia japonica japonica*; △: *Culicia japonica tenuisepes* n. ssp., showing no statistical differences between them.

Marine Center (NMCI-CO 00012).

Reference Specimens: *Culicia japonica japonica* (Yabe & Eguchi, 1936), newly collected from Kanaya, Tokyo Bay, Izu Hachijo Island, and off Tsukumo Bay, Ishikawa Prefecture. *C. rubeola* (Quoy & Gaimard, 1833), newly collected from Izu Hachijo Island, Izu Ooshima Island, and Ogasawara Islands.

Description of Holotype

Corallites cylindrical, calices almost circular, 10 mature corallites averaging 3.9 mm (range: 3.3–4.2) × 4.4 mm (4.0–5.3) in calicular diameter, 2.9 mm (2.0–4.0) in height, and 1.8 mm (1.0–2.0) in fossal depth. Corallites epithecate and dark white to grey under the conditions deposited, epitheca rising well above upper septal margins. Corallites connected to one another by thin, flat stolon, only one case of intratentacular budding found. Polyps with pinkish white coenenchyme and transparent tentacles.

Septa hexamerally arranged in three complete cycles, fourth cycle undeveloped and incomplete, corallites having 30–42 septa (mean: 37). S1 (first cycle septa) consisting of thin, 0.11 mm wide (range: 0.10–0.15 mm). S2 consisting of almost same width as S1 (0.10 mm, no variability observed among corallites). S3 also of almost same width as S1 and S2, 0.10 mm (0.08–0.10). S4 consisting of quite thin, 0.08 mm wide (0.05–0.10), and linear rudiments. S1 to S3 reaching columella without fusion. Those of S1 with 1 to 2 paliform lobes, those of S2 and S3 with 2 to 3 paliform lobes. Columella papillose.

Etymology. The subspecific name *tenuisepes* is a combination of *tenuis* meaning thin and *sepes* meaning fence or wall in Latin.

Remarks

This new subspecies is easily distinguishable from the newly recognized nominotypical subspecies *Culicia japonica japonica* in that S1 to S3 consist of very thin septa, there is a small number of paliform lobes, no fusion between S2 and S3 or S3 and S4, and a deeper fossa. However, a morphometrical analysis of the relationship between corallite

diameter and the number of septa reveals no difference among the two subspecies (Fig. 1); furthermore, young peripheral corallites of the same colony from which the holotype sample was collected are similar to corallites of *C. japonica japonica* (cf. Fig. 3). We reported that both species distributed different depth at the Sea of Japan (Ogawa et al., 1996): *C. japonica japonica* found in deep water, more than 70m, on the contrary *C. japonica tenuisepes* found in very shallow (0.5–1.5m). These facts suggest that the morphological differences apply at the subspecies level.

Hitherto 12 nominal species of *Culicia* have been reported, and Fig. 2 shows a morphometrical comparison of all these species with this study, based on the hypothesis that if the septal arrangements and numbers are controlled by intrinsic genetic factors, septal numbers are constant at the mature stage. Based on this analysis, the difference between *C. japonica japonica* and *C. stellata* Dana, 1846 is at the subspecies level, and the overlap of the fields of correlation between corallite diameter and septal number also indicates that only a biogeographical or habitat difference is involved.

C. japonica japonica is distributed in more northern and deeper waters, while *C. stellata* is distributed in temperate or subtropical shallow waters. *C. japonica tenuisepes* represents the northernmost record of *Culicia* in Japan and the shallowest record of the genus in the world.

Recently, we found *C. japonica tenuisepes* had color variations and one of which was associated with blue green algae and also small number of zooxanthellae were presented (Ogawa and Sakai, 1997), in addition fertilized eggs and planular larvae were observed (Sakai et al., 1997).

***Culicia subaustraliensis* n. sp.**

(Japanese name: futo-juzu-sango, new)

(Plate VI, Fig. 2., Text-figs. 2 & 3)

Material examined.

Holotype: 5.9 cm × 4.5 cm, consisting of 27 corallites. Paratype: 5.2 cm × 3.8 cm, consisting of 20 corallites. All the specimens were collected on 6 July, 1980, by K. Takahashi using SCUBA, at Izu Hachijo Island, off the Pacific coast of Honshu, Tokyo, Japan. The holotype is deposited in the National Science Museum, Tokyo (NSMT-Co 564), the paratype in the Takahashi collection.

Reference Specimens: *C. japonica japonica*, newly collected from Kanaya, Tokyo Bay, Izu Hachijo Island, and off the Noto Peninsula, Ishikawa Prefecture. *C. rubecula* newly collected from Izu Hachijou Island, Izu Ooshima Island, and Ogasawara Islands. The above-described new subspecies, *C. japonica tenuisepes*.

Description of holotype

Corallites cylindrical, calices almost circular, 10 mature corallites averaging 5.3 mm (range: 4.3–6.6) × 5.6 mm (4.4–6.8) in calicular diameter, 5.3 mm (3.0–9.0) in height, and 1.3 mm (0.5–2.0) in fossal depth. Corallite epithecate and white, epitheca often rising well above upper septal margins. Corallites connected to one another by rather thick, flat stolon. Polyps orange to brown.

Septa hexamerally arranged in three complete cycles, fourth cycle undeveloped and incomplete, corallites with 36–46 septa (mean: 40). S1 broad 0.46 mm (range: 0.40–0.50). S2 0.37 mm (0.25–0.50) wide. S3 same width as S2, 0.38 mm (0.35–0.40). S4 quite thin 0.16 mm (0.10–0.25). One pair of S4 occurring on dorso-ventral axis and united with S3 to form pseudo-Pourtalès plan (P. P. plan: Ogawa et al., 1996). S1 having 1 to 2 paliform lobes, S2 and S3 having 3 to 4 paliform lobes. Columella papillose.

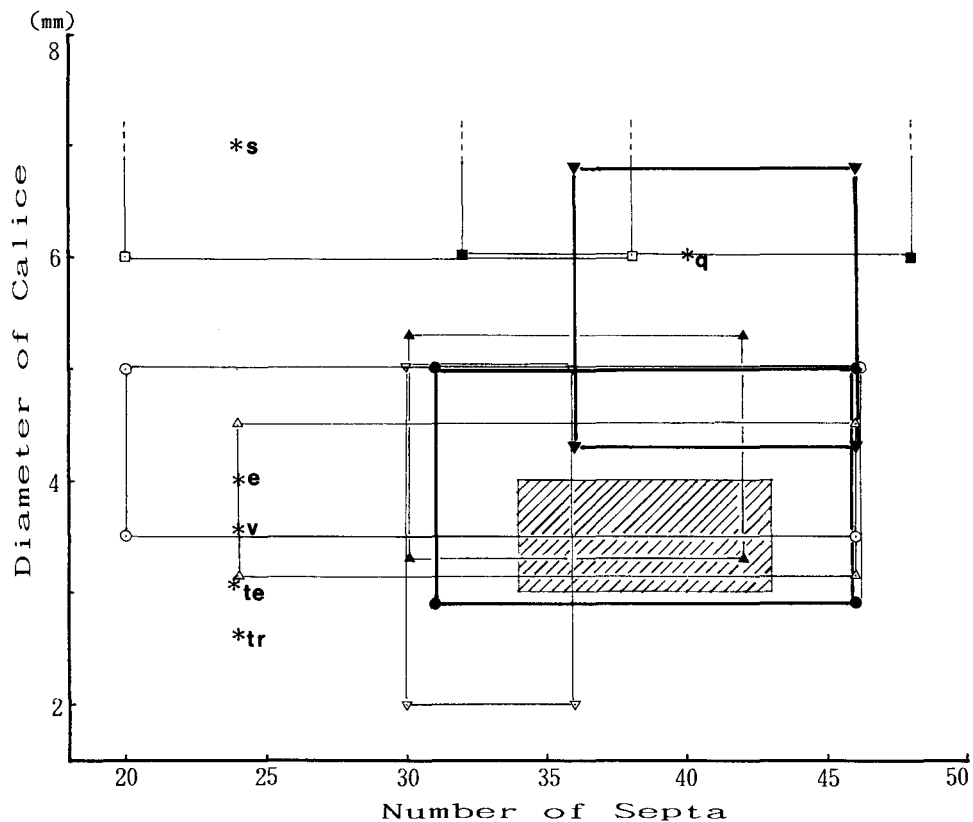


Fig. 2. Comparison of *Culicia subaustraliensis* n. sp., *Culicia japonica tenuisepes* n. ssp., and hitherto reported 12 species of *Culicia*. ●-●: *C. japonica japonica*, after Yabe & Eguchi (1936) holotype dimensions indicated oblique lines, Song (1982), and Ogawa et al. (1996); ▼-▼: *C. subaustraliensis*, n. sp.; ▲-▲: *C. japonica tenuisepes*, n. ssp.; ○-○: *C. rubeola*, after Quoy & Gaimard (1833), Tenison-Wood (1878), Wells (1954), Squires (1960, 1966), Pillai and Scheer (1974), Cairns (1994), and Ogawa et al. (1996); Δ-Δ: *C. stellata*, after Dana (1846) and Nemenzo (1976); ■-■: *C. australiensis*, after Hoffmeister (1933) and Cairns & Parker (1992); □-□: *C. hoffmeisteri*, after Squires (1966) and Cairns & Parker (1992), excluding Eguchi (1973) which was reported diameter of 1.5–1.8mm; ▽-▽: *C. cuticulata*, after Klunzinger (1879); *e: *C. excavata*, after Milne-Edwards & Haime (1850); *q: *C. quinaria*, after Tenison-Wood (1878); *s: *C. smithii*, after Milne-Edwards & Haime (1850), Ralph & Squires (1962), and Squires & Keys (1967); *te: *C. tenella*, after Dana (1846); *tr: *C. truncata*, after Dana (1846); *v: *C. verreauxii*, after Milne-Edwards & Haime (1850). *C. vacua* was omitted from this figure, but was reported by Tenison-Wood (1879) from New Zealand as having a 2 mm calicular diameter with 6 septa.

Etymology. The specific name *subaustraliensis* is a combination of prefix *sub*, meaning under in Latin, and the specific name of *Culicia australiensis* Hoffmeister, 1933 to which the new species is very similar.

Remarks

This new species has a similar septal arrangement to that of *Culicia rubeola*

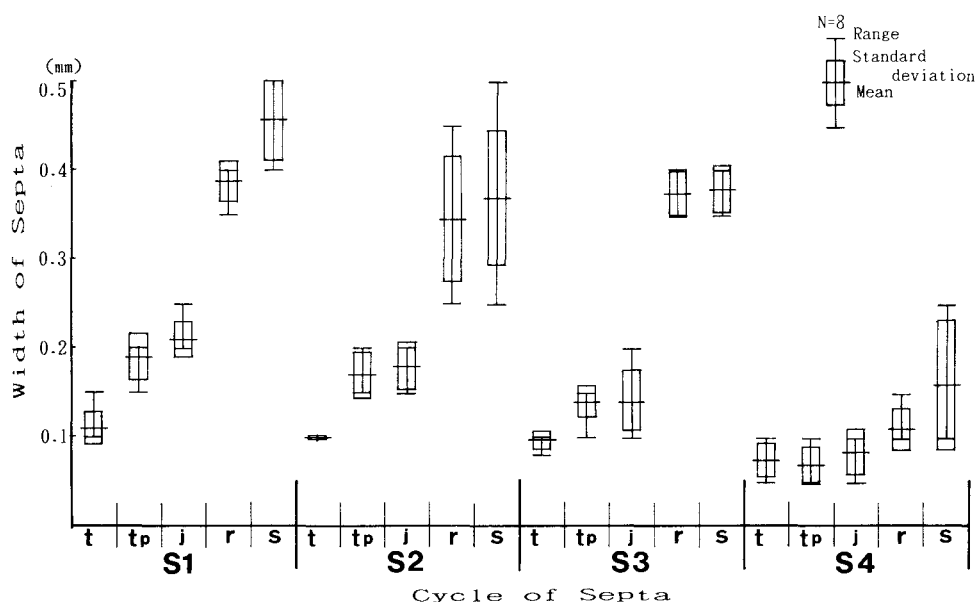


Fig. 3. Comparison of width of septa among four species of *Culicia* in Japan. t: *C. japonica tenuisepes* n. ssp.; tp: *C. japonica tenuisepes* n. ssp. collected from periphery of large colony about 6 m²; j: *C. japonica japonica*; r: *C. rubeola*; s: *C. subaustraliensis* n. sp.

which was first recorded from Japan in our previous paper (Ogawa et al., 1996), but differs in corallite size. Corallites in the new species are bigger than in *C. rubeola* and reach the same size as those of *C. australiensis* or *C. hoffmeisteri* Squires, 1966 and are intermediate between those of the *japonica* · *rubeola* · *stellata* group and the *australiensis* · *hoffmeisteri* group (Fig. 2). The four species of *Culicia* found in Japan have clear differences in the width of their septa, especially S1. Figure 3 shows the comparison of the septal width ordering; *C. subaustraliensis* has the thickest septa and *C. rubeola* placed 2nd, statistically the difference is significance at the 0.5 % level, S2 to S4 in these species have the same width, suggesting *C. subaustraliensis* is related to *C. rubeola*. On the contrary, *C. japonica japonica* is 3rd in septal width, and *C. japonica tenuisepes* has two forms, one of which is almost in accord with *C. japonica japonica*, though statistically the difference is significant at the 0.5% level.

Superfamily Caryophylloidea

Family Caryophylliidae

Phyllangia Milne-Edwards & Haime, 1848

***Phyllangia echinosepes* n. sp.**

(Japanese name: toge-iboyagi-modoki, new)

(Plate VI, Fig. 3., Text-fig. 4)

Material examined

Holotype: 3.3 cm × 2.7 cm, consisting of 19 corallites. Paratype: 2.5 cm × 1.6 cm, consisting of 6 corallites. All the specimens were collected on 11 November, 1980, by K. Takahashi using a gill net at 90m depth off Izu Hachijo Island, Tokyo, Japan. The holotype is deposited in the National Science Museum, Tokyo (NSMT-Co 565), the paratype in the Takahashi collection.

Reference Specimens: *Phyllangia hayamaensis* (Eguchi, 1968) newly collected from Kanaya

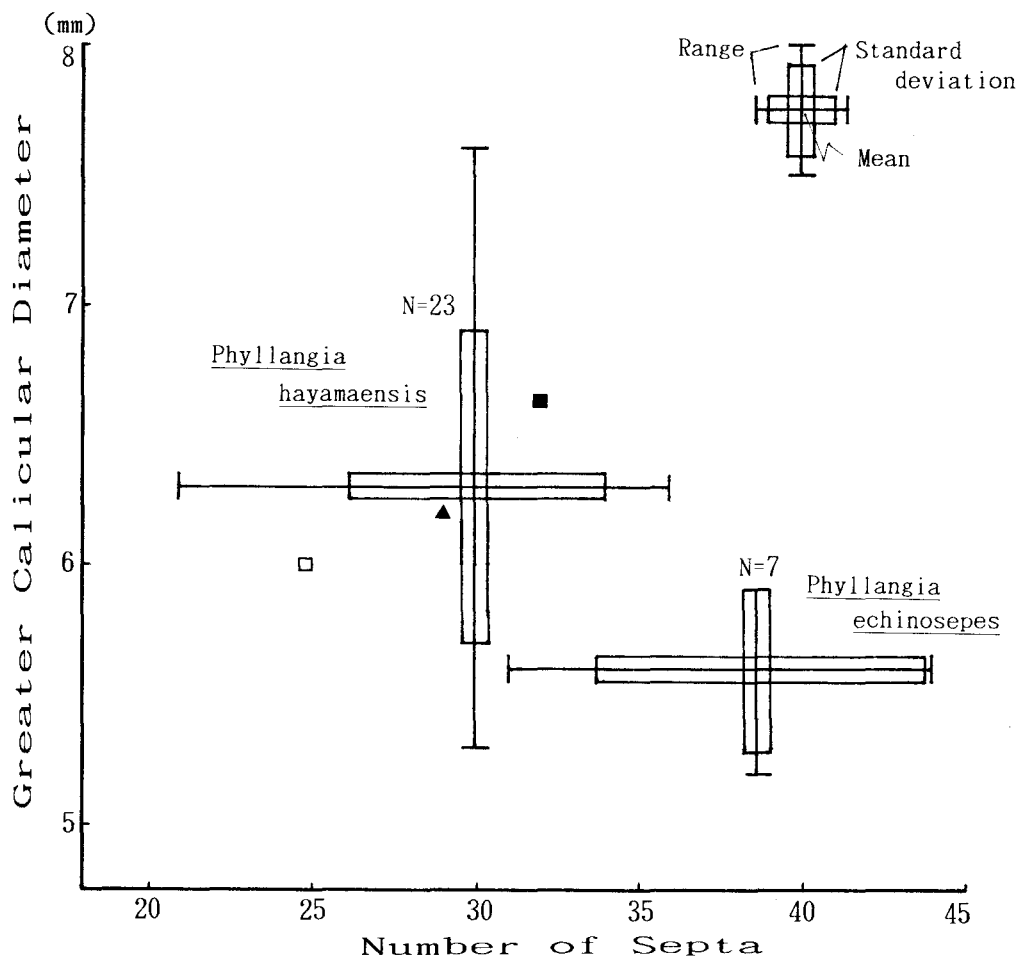


Fig. 4. Relationship between greater calicular diameter (GCD) and number of septa of *Phyllangia echinosepes* n. sp. and *Phyllangia hayamaensis*. □: Mean value of *P. hayamaensis* from Kanaya, Tokyo Bay; ■: Mean value of *P. hayamaensis* from Manazuru, Sagami Bay; ▲: Mean value of *P. hayamaensis* from Kushimoto, Wakayama Prefecture.

in Tokyo Bay, Manazuru in Sagami Bay, Kushimoto in Wakayama Prefecture, and Ogasawara Islands.

Description of Holotype

Colonies increase by extratentacular budding. Coenosteum between corallites in center of colony eventually thickening and becoming continuous between corallites. Intercalicular coenosteum, as well as theca, smooth and white, bearing thin costae only on upper margin of corallite. Corallites cylindrical and short, rising only 3–5 mm above coenosteum. Calices circular to elliptical; mean diameter of 5 corallites 5.1 mm (4.7–5.4) × 5.6 mm (5.2–5.9).

Septa hexamerally arranged in three complete cycles with incomplete fourth cycle, mean number of septa in 8 calices: 39 (range: 31–44). All septa exsert and ornamented with small spinous beads on surface. S1 highly exsert with smooth, straight axial

edges, sometimes slightly exsert in vicinity of columella. S2 approximately half as exsert as S1, but also reaching columella. S3 bear paliform lobe of variable size on lower axial edge; pairs sometimes fusing in front of adjacent S2 and extending to columella. S4 small, becoming rudimentary lower in fossa. Fossa averaging 1.6 mm deep with range of 1.0–2.0 mm. Columella variable, papillose to irregularly fused.

Etymology. The specific name *echinosepes* is a combination of *echinos* meaning spiny, and *sepes* meaning fence or wall in Latin.

Remarks

This new species is easily distinguished from the known Japanese species *Phyllangia hayamaensis* which was redescribed with corrections by us (Ogawa et al., 1996), in having spinous beads over the whole surface of the septa and smaller calices. Figure 4 shows the correlation between calice diameter and number of septa, which clearly indicates that the new species has a smaller calicular diameter but a larger number of septa than *P. hayamaensis*. This differences is statistically significant at the 0.1 % level.

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Explanation of Plate VI

Fig. 1. *Culicia japonica tenuisepes* n. ssp.
1a Enlarged calice.

Fig. 2. *Culicia subaustraliensis* n. sp.
2a Enlarged calice.

Fig. 3. *Phyllangia echinosepes* n. sp.
3a Enlarged calice.

Scales graduated in mm in Figs. 1-3.

